

Exhibit A – Scope of Work
City of Edmonds
Perrinville Creek Stormwater Flow Reduction Retrofit Study and Pre-Design Report

The City of Edmonds (“City”) desires to improve the aquatic habitat in the lower reaches of Perrinville Creek, including at its mouth in Puget Sound. The 30-inch diameter Perrinville Creek culvert under Talbot Road is a major fish barrier, and the City has completed a pre-design report for replacing it with a fish-friendly box culvert to permit access to upstream habitat. However, replacing the culvert would increase sedimentation and flooding risk in the lower reaches of Perrinville Creek.

Based on this, the City has retained Tetra Tech, Inc. (“Consultant”) to conduct a flow reduction study for the Perrinville Creek watershed with the primary goal to reduce peak flow rates and their durations through a combination of low impact development (LID) and conventional stormwater retrofits. The City has also been awarded a grant from the Department of Ecology for funding to advance the work from the above study phase to a pre-design phase of LID and/or conventional retrofits.

The primary goal of this project is to reduce flows in Perrinville Creek, a tributary to Puget Sound, by reducing stormwater runoff. The flow reduction will provide multiple hydrologic and biological benefits to both the Creek and Brown’s Bay in the Sound such as: allowing for the replacement of an anadromous fish barrier culvert, reducing erosion and sedimentation that is impacting aquatic habitat and City infrastructure, and reducing the amount of pollutants in the aquatic environment.

This study will develop a plan to accomplish this goal through implementation of low impact development (LID) best management practices (BMPs) to the extent feasible, other stormwater BMPs, and stream stabilization in Perrinville Creek. Stream flow targets will be determined by assessing existing flow conditions and geomorphic conditions at critical sources of sediment. A hydrologic model will be developed to characterize existing conditions and assess performance of alternative future scenarios. Future scenarios will include feasible and readily implementable infiltration and other flow control stormwater BMPs and water quality treatment BMPs. Geotechnical investigations in the basin will be completed to improve model simulation of existing and proposed stormwater BMPs. A high priority project or set of projects identified through the study will be selected for preliminary design. Site-specific geotechnical investigations at the project site will inform the preliminary design. The project team will present project results to the City Council to inform decision-makers and to the public to support implementation.

Consultant will complete the flow reduction study and the project pre-design in accomplishing the following tasks.

I. Base Tasks

Tasks 1 through 7 shall be performed by the Consultant, following a notice to proceed (NTP) by the City Project Manager.

Task 1 - Define the Current Watershed Hydrology

Consultant will utilize the Western Washington Hydrologic Model or other Hydrologic Simulation Program (HSPF)-based model to support the analyses and decision-making involved in this study, to support the eventual design of the fish-passible Talbot Road culvert, and to update the selected retrofit strategy as it progresses. Model selection will consider the types of analyses required (peak discharge rates, flow durations), target conditions selected (see Task 2B, below), supporting data available or readily generated, and incorporation of considered LID flow reduction techniques.

The model will use precipitation characteristics derived for the watershed location and reviewed against precipitation data from King County's Brugger's Bog station. The model will utilize and update existing available data from the cities of Edmonds and Lynnwood, including model input files, storm drainage system mapping, construction plans for detention/treatment/infiltration facilities, GIS data describing topography, land use, aerial imagery, sensitive/critical areas, and geology. Consultant will consolidate geologic mapping data from multiple sources and add to the project database.

Consultant will confirm the delineation of the Perrinville Creek watershed and subbasins within the watershed. The subbasins will be characterized for input to the hydrologic model, and the model will be constructed using the selected software. The model will not route flow through pipe systems or channels, but may route flows through the existing 30-inch culvert under Talbot Road to assess attenuation effects of the culvert and storage behind the roadway fill on discharges below Talbot Road.

The cities of Edmonds and Lynnwood will compile available information on the configuration and condition of existing flow control facilities (e.g., detention and infiltration facilities) within the watershed; information on historic sediment removal from traps, the creek, and from the stormwater system (catch basins, detention facilities); flow monitoring; and groundwater/piezometric data at infiltration facilities. Consultant will review the information on existing detention and infiltration facilities in the watershed, select those facilities having significant effect on subbasin discharges or the overall watershed hydrology, define the selected facilities' performance characteristics, and incorporate those facilities into the hydrologic model.

The model will be run to simulate existing conditions hydrology in the watershed, and will produce data at the discharge from each subbasin and at key locations along Perrinville Creek. Data available for the 2012/2013 wet season collected at the City of Edmonds' (City's) flow gauge installed above the Talbot Road crossing will be used to provide a reasonableness check of the hydrologic model results.

Deliverables:

1. Quality Assurance Project Plan for hydrologic model, including review of flow data
2. Hydrologic model of existing conditions in the Perrinville Creek watershed
3. Technical memorandum summarizing data used in the model, model construction, and results

Task 2 - Define the Target Conditions in Perrinville Creek

Consultant will quantify the target flow conditions in Perrinville Creek using the following metrics:

- Discharges that enable fish passage at the proposed Talbot Road crossing
- Large storm peak discharges below Talbot Road that are not increased over current conditions with the proposed fish passage crossing installed
- Flow regime metrics (peak discharges, specific flow durations) that limit erosion in the stream channel, and sediment deposition downstream, to acceptable levels.

Peak discharge targets will primarily be set to enable fish passage at the proposed Talbot Road crossing and to reduce sedimentation of existing aquatic habitat. These targets will have the secondary benefits of preventing further destruction of existing aquatic habitat downstream from the existing Talbot Road culvert by the stream's power fish passage and avoid property flooding. Consultant will use information developed for the Talbot Road crossing project and prior investigations into downstream conditions. To define *target flow regime conditions* in the stream reaches, Consultant will conduct a geomorphology assessment of conditions along the stream channel from Talbot Road to 76th Avenue West. This assessment will update and expand on prior geomorphic assessments (Pentec, Herrera) to characterize channel 'pavements', locate failures, and determine flow thresholds at various locations at which destabilizing scour occurs. Consultant will estimate sediment mobilization through the creek.

Consultant will define target flow regimes assuming the channel is left in its current state, and for an alternative condition whereby the weakest segments of the channel would be stabilized to resist scour.

Deliverables:

1. QAPP for collection and review of pebble count data
2. Technical memorandum of the geomorphic analysis results, presenting findings and recommending target flow conditions in Perrinville Creek

Task 3 - Identify Flow Reduction Opportunities

Analyzing data obtained through Edmonds' and Lynnwood's GIS, Consultant will identify areas presenting opportunities to significantly reduce the peak discharge and/or volume of runoff entering Perrinville Creek. Candidate areas will be considered from throughout the watershed, including areas in both Edmonds and Lynnwood. Consultant will conduct field review of the candidate areas to confirm site characteristics for potential retrofit projects. The following characteristics will be used to identify subdrainages within the basin having potential for significant flow reduction within Perrinville Creek:

- Tributary drainage area
- Location within the basin
- Suitable site characteristics (space/grades)
- Subsurface geology
- Surficial soils

Categories of flow reduction improvements may include:

- Public right-of-way LID/BMP retrofit
- Facilitate private property LID/BMP retrofit

- Modify existing detention facility storage volume or outlet structure (including rain gardens in specific neighborhoods)
- Surface storage (i.e., parking, street, open space)
- New detention facility
- Modify existing detention facility to infiltrate
- New surface infiltration or UIC facility

Consultant will identify locations and alternative methods to stabilize mainstem and tributary stream channels to better resist mobilization of sediment.

Deliverables:

1. Technical memorandum prioritizing subbasins and identifying opportunities for significant flow interception and reduction, and identifying stream channel stabilization locations.

Task 4 - Evaluate Candidate Flow Reduction Performance

Consultant will conduct a screening workshop with the cities of Edmonds and Lynnwood of the flow reduction opportunities (projects) identified in Task 2C. Prospects having fatal flaws or judged to provide limited flow reduction benefit will be removed from consideration.

Utilizing the geologic information developed under Task 2D, Consultant will apply the BMP Assessment Module in the EPA's System for Urban Stormwater Treatment and Analysis Integration Model (SUSTAIN) to generate BMP performance curves for the various retrofit techniques being considered. The BMP performance curves will be used to quantify the potential flow reduction capability for each of the remaining active projects.

The BMP performance curves will be applied to the active projects and incorporated into the watershed model, and the model will be run to assess their combined effects at three locations: (1) the head of the Perrinville Creek ravine, (2) a selected mainstem location along the ravine, and (3) below the Talbot Road crossing. The hydrology will also be assessed at the discharge points to the steeper tributaries that enter the Perrinville Creek mainstem below the head of the ravine. Based on the outcomes of this model simulation, Consultant will perform up to two (2) additional simulations employing different combinations of projects.

For each combination of projects simulated, Consultant will evaluate the resulting hydrologic conditions at the above-noted locations. Consultant will also document the estimated reduction in duration of discharges exceeding sediment mobilization thresholds.

Deliverables:

1. QAPP for use of BMP Assessment Module
2. Technical memorandum summarizing individual project analyses and estimated hydrologic/sediment mobilization/peak discharge performance of alternative combinations of projects

Task 5 - Public Information and Engagement

City staff, with Consultant support, will conduct:

- Three (3) briefings to City Council/committee at appropriate stages of the study's completion
- Two (2) meetings with interest groups to discuss the study
- Two (2) neighborhood meetings to discuss the study

Deliverable:

1. Presentation materials of the project analyses for Edmonds City Council meetings and neighborhood meetings

Task 6 - Recommended Flow Reduction Plan

Consultant will compile a report documenting the recommended plan of flow reduction/stabilization projects and detailing the collective hydrologic performance, stream system benefits, costs, risks, and other key features. The technical memoranda developed under prior tasks will be incorporated into either the body of the report or as referenced appendices.

A final model simulation will be completed incorporating the recommended projects, both with the existing Talbot Road culvert and the proposed replacement culvert. The flow reduction plan description will include:

- Hydrologic benefits to stream channel stability and discharge conditions
- Anticipated BMP performance of the recommended projects
- Channel stabilization in addition to flow reductions to control sediment mobilization
- Planning level capital design, real estate, and construction costs
- Maintenance requirements/life cycle costs
- Permitting requirements and implementation timelines
- Potential liabilities (nuisance, flooding, groundwater surcharge, slope instability)

Consultant will develop an implementation plan that prioritizes the projects based on established criteria. The plan may include non-structural recommendations such a basin-wide flow control standard at lower thresholds and/or with more restrictive discharge requirements than those in the Ecology manual. The plan will include, as appropriate, "early actions" that the City can implement within a relatively short period of time to demonstrate benefits to the creek.

The plan will also identify the threshold hydrologic conditions for advancing the Talbot Road culvert construction.

Deliverables:

1. Draft Perrinville Creek Stormwater Flow Reduction Retrofit Study report
2. Final Perrinville Creek Stormwater Flow Reduction Retrofit Study report

Task 7 - Project Management, Coordination and Reporting

Consultant will provide day-to-day coordination and communications with City, direct the Consultant team efforts, monitor project progress against budget and schedule, and report monthly to the City on project status. Monthly progress reports will accompany Consultant invoices, serving as formal status updates to complement the ongoing coordination and updates during the month.

Deliverables:

1. Monthly progress reports and invoices

II. Optional Tasks

The City shall send a second NTP to the Consultant for the following optional tasks, only after the City successfully enters in to a grant agreement with the Department of Ecology for \$188,772 and the parties execute a written Amendment to the parties' Professional Services Agreement, to which this Scope of Work applies.

Task 8 - Geologic/Geotechnical Characterization

Consultant will conduct records research and geologic field investigations at selected locations to assess the infiltration potential of surficial soils, subsurface formations, and depth to groundwater. Investigations will specifically assess site suitability for infiltration and will be performed in both outwash and till soil areas. Test pits will be excavated where depth to infiltrative soils is less than 10 feet; where necessary to access a deeper layer of till soil, borings of up to 50 feet deep will be completed and logged. Piezometers will be installed in borings to monitor groundwater conditions. At each location site, Consultant will complete geotechnical characterizations of the subsurface conditions for purposes of informing the preliminary design of retrofit projects under Task 2C.

Deliverables:

1. QAPP for geologic/soils data collection and interpretation
2. Technical memorandum summarizing results of records research, geologic/geotechnical investigations, interpretations of infiltrative capacities, and geotechnical design recommendations

Task 9 - Expanded Stream Flow Monitoring

The flow monitoring effort above the Talbot Road culvert that was established at the onset of the 2012/2013 wet season will be extended through the 2013/2014 wet season. Two additional flow monitoring stations will be established prior to the 2013/2014 wet season in the watershed to enhance the calibration of the hydrologic model. The two new stations will be situated at the top of the ravine and within one of the tributary drainages.

The resulting flow monitoring data will be reviewed for quality and analyzed to identify where any adjustments to the hydrologic model should be made. Where indicated, the hydrologic model will be updated and re-run prior to finalizing the study report under Task 2G.

Deliverables:

1. QAPP for flow monitoring data collection and review

2. Technical memorandum summarizing flow monitoring results

Task 10 – Pre-Design and Report

Consultant will complete the preliminary design of one or more priority retrofit projects selected from the projects identified in the recommended Flow Reduction Retrofit Study report. The preliminary design will be documented in a Pre-Design Report containing:

- Executive Summary
- Description of design team's qualifications, experience, licensure, and relationship to the City
- Description of the problem, and how the project was identified and selected as a priority action
- Summary of anticipated project performance and how it will address the identified problem
- Site assessment information, including geotechnical characterization
- Preliminary project design with plan/elevation/sections, hydraulics, PE stamp, and signature
- Environmental review documentation
- Estimated project capital costs
- Description of facility maintenance needs and responsibilities, along with estimated costs

Deliverables:

1. Draft Pre-Design Report
2. Final Pre-Design Report

Task 11 – Additional Project Management, Coordination and Reporting

Consultant will additionally provide day-to-day coordination and communications with City, direct the Consultant team efforts, monitor project progress against budget and schedule, and report monthly to the City on project status for the additional optional tasks. Monthly progress reports will accompany Consultant invoices, serving as formal status updates to complement the ongoing coordination and updates during the month.

Exhibit B - Budget

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